

|                         |   |
|-------------------------|---|
| 1. Record Nr.           | UNINA9910819744203321   |
| Autore                  | Wang Yun  |
| Titolo                  | PEM fuel cells : thermal and water management fundamentals / / Yun Wang, Ken S. Chen, and Sung Chan Cho   |
| Pubbl/distr/stampa      | New York : , : Momentum Press, LLC, , [2013]<br>©2013   |
| ISBN                    | 1-299-45668-5<br>1-60650-247-6  |
| Descrizione fisica      | 1 online resource (420 p.)  |
| Disciplina              | 621.312429  |
| Soggetti                | Proton exchange membrane fuel cells   |
| Lingua di pubblicazione | Inglese   |
| Formato                 | Materiale a stampa  |
| Livello bibliografico   | Monografia  |
| Note generali           | Includes index.   |
| Nota di bibliografia    | Includes bibliographical references and index.  |
| Nota di contenuto       | Preface -- List of figures -- List of tables -- Nomenclature --<br>1. Introduction -- 1.1 Energy challenges -- 1.2 Fuel cells and their roles in addressing the energy challenges -- 1.3 PEM fuel cells -- 1.3.1 PEM fuel cell operation -- 1.3.2 Current status of PEM fuel cells -- 1.3.3 Thermal and water management --<br>2. Basics of PEM fuel cells -- 2.1 Thermodynamics -- 2.1.1 Internal energy and the first law of thermodynamics -- 2.1.2 Enthalpy change -- 2.1.3 Entropy change and the second law of thermodynamics -- 2.1.4 Gibbs free energy and thermodynamic voltage -- 2.1.5 Chemical potential and Nernst equation -- 2.1.6 Relative humidity and phase change -- 2.2 Electrochemical reaction kinetics -- 2.2.1 Electrochemical kinetics -- 2.2.2 Electrochemical mechanisms in PEM fuel cells -- 2.2.3 Linear approximation and Tafel equation -- 2.3 Voltage loss mechanisms and a simplified model -- 2.3.1 Open circuit voltage (OCV) -- 2.3.2 Activation loss -- 2.3.3 Ohmic loss -- 2.3.4 Transport voltage loss -- 2.3.5 Current-voltage (I-V) curve and operation efficiency -- 2.3.6 Role of water and thermal management -- 2.4 Chapter summary --<br>3. Fundamentals of heat and mass transfer -- 3.1 Introduction -- 3.2 Conservation equations -- 3.2.1 General forms -- 3.2.2 Mass and momentum conservation -- 3.2.3 Energy equation -- 3.2.4 Species transport equation -- 3.3 Constitutive equations -- 3.3.1 A lattice |

model -- 3.3.2 Fourier's law and Fick's law -- 3.4 Scaling and dimensionless groups -- 3.4.1 Scaling and dimensionless equations -- 3.4.2 Dimensionless groups -- 3.5 Chapter summary --

4. Water and its transport in the polymer electrolyte membrane -- 4.1 Introduction to the polymer electrolyte membrane -- 4.2 Ion transport and ionic conductivity -- 4.2.1 Proton transport -- 4.2.2 Ionic conductivity correlations -- 4.2.3 Ionic conductivity measurement --

4.3 Water transport in polymer electrolyte membranes -- 4.3.1 Transport mechanisms -- 4.3.2 Water holding capacity -- 4.4 Water quantification using neutron radiography -- 4.5 Ion transport in cathode catalyst layers -- 4.5.1 Variation in water content in catalyst layers -- 4.5.2 Proton transport in cathode catalyst layers -- 4.5.3 Multiple-layered cathode catalyst layers -- 4.6 Chapter summary --

5. Vapor-phase water removal and management -- 5.1 Mass transport overview -- 5.2 Diffusion -- 5.2.1 Diffusivity -- 5.2.2 Molecular versus Knudsen diffusion -- 5.2.3 Diffusion in GDLs -- 5.3 Species convection -- 5.3.1 Flow modeling with constant-flow assumption -- 5.3.2 Flow formulation without the constant-flow assumption -- 5.3.3 Convection in GDLs -- 5.4 Pore-scale transport -- 5.4.1 Stochastic material reconstruction -- 5.4.2 Pore-scale transport modeling -- 5.4.3 Pore-level phenomena -- 5.5 Transient phenomena -- 5.5.1 Transient terms and time constants -- 5.5.2 Transient undergoing constant voltage or step change in voltage -- 5.5.3 Transient undergoing constant current or step change in current -- 5.6 Water management between a PEM fuel cell and fuel processor -- 5.6.1 Water balance model -- 5.6.2 Effect of the steam-to-carbon ratio -- 5.7 Chapter summary --

6. Liquid water dynamics and removal -- 6.1 Multiphase flow overview -- 6.1.1 Modeling multi-phase flows -- 6.2 Multiphase flow in GDLS/CLS -- 6.2.1 Experimental visualization -- 6.2.1.1 X-ray imaging -- 6.2.1.2 Neutron radiography -- 6.2.2 Multiphase mixture (M2) formulation -- 6.2.2.1 Flow equations -- 6.2.2.2 Species transport -- 6.2.2.3 Model prediction -- 6.2.3 Carbon paper (CP) versus carbon cloth (CC) -- 6.2.4 Spatially varying properties -- 6.2.4.1 Through-plane variation in the GDL property -- 6.2.4.2 In-plane property variation and the effect of land compression -- 6.2.4.3 Microporous layers (MPLs) -- 6.3 Multiphase flow in gas flow channels (GFCS) -- 6.3.1 Experimental visualization -- 6.3.2 Two-phase flow patterns -- 6.3.3 Modeling two-phase flow -- 6.3.3.1 The mixture model -- 6.3.3.2 Two-fluid modeling -- 6.4 Water droplet dynamics at the GDL/GFC interface -- 6.4.1 Force balance on a spherical-shape droplet -- 6.4.2 Droplet deformation -- 6.4.3 Droplet detachment -- 6.4.3.1 Control volume method -- 6.4.3.2 Derivation using the drag coefficient (CD) -- 6.5 Chapter summary --

7. Ice dynamics and removal -- 7.1 Subfreezing operation-overview -- 7.2 Ice formation -- 7.2.1 Water transport and conservation -- 7.2.2 Three cold-start stages -- 7.2.2.1 First stage: membrane hydration -- 7.2.2.2 Second stage: ice formation -- 7.2.2.3 Third stage: ice melting -- 7.3 Voltage loss due to ice formation -- 7.3.1 Spatial variation of the oxygen reduction reaction (ORR) -- 7.3.2 The ORR rate under subfreezing temperature -- 7.3.3 Oxygen profile in the catalyst layer -- 7.3.4 Voltage loss due to ice formation -- 7.3.5 A model of cold-start cell voltage -- 7.4 State of subfreezing water -- 7.5 Chapter summary --

8. Thermal transport and management -- 8.1 Heat transfer overview -- 8.1.1 Heat transfer and its importance -- 8.1.2 Heat transfer modes -- 8.1.2.1 Heat conduction -- 8.1.2.2 Convective heat transfer -- 8.1.2.3 Heat radiation -- 8.1.3 Heat transfer in porous media -- 8.2 Heating mechanisms -- 8.2.1 The entropic heat -- 8.2.2 Irreversibility of the electrochemical reactions -- 8.2.3 The Joules heat -- 8.3 Steady-state

heat transfer -- 8.3.1 One-dimensional (1D) heat transfer analysis -- 8.3.2 Two-dimensional (2D) heat transfer analysis -- 8.3.3 Numerical analysis -- 8.3.3.1 Macroscopic model prediction -- 8.3.3.2 Pore-level heat transfer -- 8.4 Transient phenomena -- 8.4.1 General transient operation -- 8.4.2 Transient subfreezing operation -- 8.4.2.1 Temperature evolution and voltage loss -- 8.4.2.2 Activation voltage loss -- 8.4.2.3 Ohmic voltage loss -- 8.5 Experimental measurement of thermal conductivity -- 8.6 Cooling methods -- 8.6.1 Heat spreaders cooling -- 8.6.2 Cooling by air or liquid flow -- 8.6.3 Phase-change-based cooling -- 8.7 Example: a thermal system of automotive fuel cells -- 8.7.1 A lumped-system model of a PEM fuel cell -- 8.7.2 Bypass valve -- 8.7.3 Radiator -- 8.7.4 Transport delay -- 8.7.5 Fluid mixer -- 8.7.6 Cathode intercooler -- 8.7.7 Anode heat exchanger -- 8.8 Chapter summary --

9. Coupled thermal-water management: phase change -- 9.1 Introduction to phase change -- 9.2 Vapor-liquid phase change: evaporation and condensation -- 9.2.1 Vapor-phase water diffusion and heat pipe effect -- 9.2.2 GDL de-wetting -- 9.2.3 GDL de-wetting and voltage loss -- 9.2.4 A general definition of the Damkohler number,  $Da$  -- 9.2.4.1 Local heating and vapor-phase removal -- 9.2.4.2 A specific Damkohler number -- 9.2.4.3 Liquid-free passages -- 9.2.4.4 2D numerical simulation -- 9.3 Freezing/thawing -- 9.3.1 Temperature spatial and temporal variation -- 9.3.2 Non-isothermal cold start -- 9.3.3 Freezing/thawing and degradation -- 9.4 System-level analysis of coupled thermal and water management -- 9.4.1 Flow rates of species and two-phase flows -- 9.4.2 Energy balance -- 9.5 Chapter summary.

---

#### Sommario/riassunto

Polymer electrolyte membrane (PEM) fuel cells, which convert the chemical energy stored in hydrogen fuel directly and efficiently to electrical energy with water as the only by-product, have the potential to reduce our energy usage, pollutant emissions, and dependency on fossil fuels. Tremendous efforts have been made so far, particularly during the last couple of decades or so, on advancing the PEM fuel cell technology and fundamental research. In addition to the large number of research and review paper publications, several classic books have been published and are available in the market, which are primarily for introductory level readers. There are, however, very few books that address the graduate-level or advanced aspects of PEM fuel cells and are based on the first principles or conservation laws, dimensionless analysis, time constant evaluation, and numerical simulation by solving partial differential equations. There are abundant knowledge regarding flow, heat transfer, and mass transport in general engineering, which has been successfully extended to the water and thermal management of PEM fuel cells. This book contributes to this aspect of PEM fuel cell technology; that is, it focuses on the fundamental understanding of phenomena or processes involved in PEM fuel cells.

---

|                         |  |
|-------------------------|--|
| 2. Record Nr.           | UNINA9910811051403321  |
| Autore                  | Abbott Stacey  |
| Titolo                  | Undead apocalypse : vampires and zombies in the 21st century // Stacey Abbott [[electronic resource]]  |
| Pubbl/distr/stampa      | Edinburgh : , : Edinburgh University Press, , 2016   |
| ISBN                    | 1-4744-2672-7<br>0-7486-9493-5<br>0-7486-9492-7  |
| Descrizione fisica      | 1 online resource (ix, 225 pages) : digital, PDF file(s)   |
| Classificazione         | HD 402   |
| Disciplina              | 791.43/675   |
| Soggetti                | Vampire films - 21st century - History and criticism<br>Vampires on television - 21st century - History and criticism<br>Zombie films - 21st century - History and criticism<br>Criticism, interpretation, etc.  |
| Lingua di pubblicazione | Inglese  |
| Formato                 | Materiale a stampa   |
| Livello bibliografico   | Monografia   |
| Note generali           | Title from publisher's bibliographic system (viewed on 11 Aug 2017).   |
| Nota di bibliografia    | Includes bibliographical references and index.   |
| Nota di contenuto       | Machine generated contents note: ; 1. The Legacy of Richard Matheson's <i>I Am Legend</i> -- ; 2. 'Cancer with a Purpose': Putting the Vampire Under the Microscope -- ; 3. The Cinematic Rising: The Resurgence of the Zombie -- ; 4. A Very Slow Apocalypse: Zombie TV -- ; 5. The Hybrid Hero -- ; 6. 'Be Me': I-Vampire/I-Zombie -- ; 7. How to Survive a Vampire Apocalypse: Or, What to Do When the Vampires are Us.   |
| Sommario/riassunto      | Explores the intersection of the vampire and zombie with 21st Century dystopian and post-apocalyptic cinema. Twenty-first century film and television is overwhelmed with images of the undead. Vampires and zombies have often been seen as oppositional: one alluring, the other repellent; one seductive, the other infectious. With case studies of films like <i>I Am Legend</i> and <i>28 Days Later</i> , as well as TV programmes like <i>Angel</i> and <i>The Walking Dead</i> , this book challenges these popular assumptions and reveals the increasing interconnection of undead genres. Exploring how the figure of the vampire has been infused with the language of science, disease and apocalypse, while the zombie text has increasingly been influenced by the trope of the 'reluctant' vampire, |

Stacey Abbott shows how both archetypes are actually two sides of the same undead coin. When considered together they present a dystopian, sometimes apocalyptic, vision of twenty-first century existence.

</p>Key features<ul><li>Rather than seeing them as separate or oppositional, this book explores the intersection and dialogue between the vampire and zombie across film and television</li><li>Much contemporary scholarship on the vampire focuses on Dark Romance, while this book explores the more horror-based end of the genre</li><li>Offers a detailed discussion of the development of zombie television</li><li>Provides a detailed examination of Richard Matheson's *I Am Legend*, including the novel, the script, the adaptations and the BBFC's response to Matheson's script</li></ul>

---